Research on Influencing Factors of Residents Watching Cross Talk based on Logistic Regression

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Abstract

Cross talk, a folk rap art in the form of speaking, learning, amusing and singing, was included in the first batch of intangible cultural heritage in Beijing in 2006. Starting from the dimensions of basic information, viewing cost, actor popularity, and performance theme, Logistic regression is used to analyze the influencing factors of residents' choice of cross talk. Finally, using text mining, qualitative comparative analysis and other methods to clarify the successful path of Deyun Club from the three dimensions of star effect, cultural effect and marketing effect.

Keywords

Cross Talk; Logistic Regression; Qualitative Comparative Analysis; Deyun Club.

1. Introduction

In the research process of this paper, a combination of macro social background and micro data analysis is adopted, starting from the current situation of Jiangsu residents' cognition of cross talk performances, comprehensively considering the development direction and form of cross talk, and understanding residents' willingness to inherit cross talk. The research contents are as follows:

(1). To collect basic information on the cognition of cross talk among residents in Jiangsu Province, including gender, age, occupation, income, education, whether they have seen cross talk performances, and the level of understanding of cross talk terms. Construct resident portraits from four aspects, and analyze the understanding and cognition of cross talk performances by residents in Jiangsu Province.

(2). Collect the influencing factors that affect residents' choice of watching cross talk performances, including the cost of watching performances, recommendations from relatives and friends, popularity of actors, performance themes, publicity efforts, performance appeal, etc., and find out the key factors. The residents' trust, satisfaction and influencing factors for cross talk therapy were studied, and some existing problems of cross talk were explored.

2. Literature Review

The word "cross talk" is a combination of the "phase" of appearance and the "sound" of sound. The earliest written records on the origin of cross talk can be traced back to the Han Dynasty, as stated in "Han Shu • Xu Le Biography": "The laughter of haiku and dwarfs is no less than before." However, it was not until the Tongzhi and Xianfeng years of the Qing Dynasty that cross talk became an independent art, and it had a mature system of its own[6]. The integration of mobile communication technology and Internet technology has brought mankind into a new era of mobile Internet, and the arrival of new media marketing has injected new vitality into the art of cross talk. Under the influence of the popularization of IP in the cultural industry and
the star effect, the cross talk industry has moved up in time and focused, and the cross talk group headed by Deyun Club has entered the public eye and won the love of the audience. To study cross talk, one cannot avoid the "Cross Talk Dictionary" edited by Xue Baokun (2012), which is the first cross talk dictionary in China. A comprehensive summary of the art of cross talk has been made through more than 5,000 entries in terms of trade rules, arts and customs, apprenticeship and art, famous names, practitioners groups, and documents, and it has become an encyclopedia about cross talk art[1].

Since the new era, in terms of cross talk theory, there have been many monographs focusing on the history of cross talk and the theory of cross talk art. The latter expounds the characteristics of "cross talk art" and the development history of cross talk. Again, there are many researches on related papers, and the perspectives are relatively new. For example: Liu Nan (2009), in his paper "Analysis of Guo Degang’s Cross-talk Language Characteristics", expounds Guo Degang's language characteristics from three aspects: rhetorical characteristics, pragmatic characteristics, and burden characteristics[2]. In terms of the study of cross talk as a medium, the research is relatively closely related to this topic, so the author paid special attention to it and found that the research on cross talk as a medium at this stage is mainly about the change of the communication medium and the elaboration of the communication effect[3]. For example: Xiong Hanyu (2017), in his paper "Research on the Communication of Cross Talk Art in the New Media Environment", looks at the development stage of cross talk from the perspective of journalism and communication. His thesis mainly interprets the current situation of interpersonal communication, mass communication and new media communication[5].

Jiang Huiming (2016) explored the process of localization, marketization and idolization of contemporary cross talk art. Among them, Deyun Club is a well-deserved typical representative[4]. Wang Feng (2019) believes that the current predicament of cross talk art is in creation, and mining the heritage of traditional cross talk will never be a retrospective. Wang Rubing (2020) analyzed the current situation of commercialization of traditional cross talk, and believed that the cross talk industry, while returning to tradition, used the development of new media to expand the scope of audiences and break geographical restrictions[8]. However, with the rapid expansion, it also faces unavoidable challenges such as content-blind entertainment, impetuous actors’ mentality, rigid business performance forms, deformed fan groups, and chaotic cultural markets[7].

3. Model Establishment and Solution

3.1. Introduction to Logistic Regression

Logistic regression model is the most commonly used multivariate quantitative analysis method for regression analysis of binary dependent variables in sociology, psychology, demography and other fields[9]. And the weights of independent variables can be obtained through Logistic regression analysis, which prepares us to predict the possibility of events based on influencing factors. The formula is as follows:

\[
P(Y_i=1|X_i) = \frac{e^{\alpha + \sum_{j=1}^{k} \beta_k x_{ij}}}{1 + e^{\alpha + \sum_{j=1}^{k} \beta_k x_{ij}}}
\]

Among them, Y represents the dependent variable (0-1 variable, 0 means the event does not occur, 1 means the event occurs), and X=[x1,x2,...,xk]is a set of dependent variables corresponding to Y. P(Yi = 1|X) represents the probability of an event occurring after a given set of values X=[x1,x2,...,xk]. The optimal parameter \([\alpha,\beta_1,\beta_2,...,\beta_n]\) is determined by
establishing a likelihood function for a given set of dependent variables Y and a set of independent variables X corresponding to it[10].

Suppose the probability of an event occurring is

\[ P(Y_i = 1 | X_i) = p_i \]  \hspace{1cm} (2)

Then the ratio of the probability of an event occurring to the probability of not occurring is

\[ \frac{p_i}{1 - p_i} = e^{\alpha + \sum_{i=1}^{n} \beta_k X_{ki}} \] \hspace{1cm} (3)

This ratio is called the occurrence ratio of events, abbreviated as odds. odds must be positive, because 0<<1, taking the natural logarithm of odds yields a linear function:

\[ \ln\left( \frac{p_i}{1 - p_i} \right) = \alpha + \sum_{i=1}^{n} \beta_k X_{ki} \] \hspace{1cm} (4)

3.2. Data Processing

Quantify the indicators related to cross talk cognition and inheritance and development in this questionnaire, so as to use relevant software for statistical analysis and draw relevant conclusions[11]. Among them, gender and whether you have seen cross talk live performances are categorical variables, which are coded by 0-1, and age, education level, monthly income, etc. are ordinal variables, which are coded by integers with sizes[12].

3.3. Establishing Likelihood Functions

Estimate the parameters of the logistic regression model by maximum likelihood estimation. Assuming a population Y1,Y2,...,Yn consisting of N cases, the observations are marked as y1,y2,...,yn, and P(yi=1|x_i) is the conditional probability of obtaining the result yi =1 given the conditions of xi ; and the conditional probability of obtaining the result yi =0 under the same conditions is P(yi =0 | x_i) = 1 – pi . So, the probability of getting an observation is:

\[ p(y_i) = p_i^{y_i} (1 - p_i)^{1-y_i} \] \hspace{1cm} (5)

where yi =0 or yi =1. Because the observations are independent of each other, their joint distribution can be expressed as the product of the marginal distributions:

\[ L(\theta) = \prod_{i=1}^{n} p_i^{y_i} (1 - p_i)^{1-y_i} \] \hspace{1cm} (6)

The above formula is the likelihood function of n observations. Next, find the parameter estimates that maximize the value of this likelihood function, taking the logarithm of the left and right sides of the above equation.

\[ \ln[L(\theta)] = \ln[\prod_{i=1}^{n} p_i^{y_i} (1 - p_i)^{1-y_i}] = \sum_{i=1}^{n} [y_i (\alpha + \beta x_i) - \ln(1 + e^{\alpha + \beta x_i})] \] \hspace{1cm} (7)
The above formula is called the log-likelihood function. In order to estimate the values of the overall parameters $\alpha$ and $\beta$ that can maximize $\ln[L(\theta)]$, first calculate the partial derivatives of $\alpha$ and $\beta$ respectively, and then make them equal to 0, and the obtained parameters are the optimal parameters.

$$\frac{\partial \ln[L(\theta)]}{\partial \alpha} = \sum_{i=1}^{n} \left[ y_i - \frac{e^{\alpha + \beta x_i}}{1 + e^{\alpha + \beta x_i}} \right]$$  

(8)

$$\frac{\partial \ln[L(\theta)]}{\partial \beta} = \sum_{i=1}^{n} \left[ y_i - \frac{e^{\alpha + \beta x_i}}{1 + e^{\alpha + \beta x_i}} \right]x_i$$  

(9)

3.4. Selection Factors

In order to study the influencing factors of whether residents choose to watch cross talk live performances, this section selects 12 factors such as gender, age, and educational level as independent variables, and selects Saw a live performance (Yes/No) as the dependent variable for Logistic regression. The specific factors are selected. The situation is shown in Table 1.

Table 1. Independent and Dependent Variables for Logistic Regression

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Selection factors</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td>M1</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>M2</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td>M3</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td>M4</td>
</tr>
<tr>
<td>Knowledge of cross talk</td>
<td></td>
<td>M5</td>
</tr>
<tr>
<td>Cost of viewing</td>
<td></td>
<td>M6</td>
</tr>
<tr>
<td>Recommended by relatives and friends</td>
<td></td>
<td>M7</td>
</tr>
<tr>
<td>Actor popularity</td>
<td></td>
<td>M8</td>
</tr>
<tr>
<td>Performance theme</td>
<td></td>
<td>M9</td>
</tr>
<tr>
<td>Propaganda power</td>
<td></td>
<td>M10</td>
</tr>
<tr>
<td>Infectant power of performance</td>
<td></td>
<td>M11</td>
</tr>
<tr>
<td>Cross talk understanding</td>
<td></td>
<td>M12</td>
</tr>
<tr>
<td>Dependent variable</td>
<td>Saw a live performance (Yes/No)</td>
<td>S</td>
</tr>
</tbody>
</table>

3.5. Model Results

Table 2. Comprehensive test of model coefficients

<table>
<thead>
<tr>
<th>Step 1</th>
<th>chi-square</th>
<th>degrees of freedom</th>
<th>salience</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>43.24</td>
<td>12</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>43.24</td>
<td>12</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>43.24</td>
<td>12</td>
<td>0.000</td>
</tr>
<tr>
<td>Step 2</td>
<td>2.00</td>
<td>1</td>
<td>0.112</td>
</tr>
<tr>
<td></td>
<td>36.89</td>
<td>5</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>36.89</td>
<td>5</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Omnibus refers to the global likelihood ratio test of the model, step statistic is the result of the likelihood ratio test at each step compared to the previous step, and block refers to the likelihood ratio test comparing the nth block to the n-1th block. As a result, the model is the
result of the likelihood ratio test of the previous model and the model after the variables in the current model have changed[13]. The significance level is less than 0.05, and the model passes the test.

According to the Hosmer and Lemeshow test contingency table, comparing the observed value and the expected value, we can know that the observed value is roughly the same as the expected value, so it can be considered that the model fit is good, with 0.5 as the threshold, according to the observed value and the predicted value, it can be seen that the model The prediction accuracy can reach 68.77%.

Through stepwise regression, the final fitting results are obtained. As shown in Table 3, the significance level of the five variables of education level, monthly income, actor popularity, performance appeal, and understanding of cross talk are all less than 0.05. Whether residents choose to watch The live crosstalk performance has a significant impact, and the P value of the remaining variables is greater than 0.05, which has no obvious correlation with whether residents choose to watch the live crosstalk performance. The fitted equation is:

\[
\ln \left( \frac{p_i}{1 - p_i} \right) = -0.192 + 0.343x + 0.461y + 0.278z + 0.521m + 0.877n
\]

(10)

<table>
<thead>
<tr>
<th>Table 3. Analyze data</th>
<th>B</th>
<th>S.E</th>
<th>Wals</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>EXP(B) 95%C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education level (x)</td>
<td>0.343</td>
<td>0.211</td>
<td>5.903</td>
<td>1</td>
<td>0.002</td>
<td>0.343</td>
<td>0.200 0.876</td>
</tr>
<tr>
<td>Income (y)</td>
<td>0.461</td>
<td>0.443</td>
<td>2.110</td>
<td>1</td>
<td>0.000</td>
<td>1.587</td>
<td>1.333 4.018</td>
</tr>
<tr>
<td>Actor popularity (z)</td>
<td>0.278</td>
<td>0.190</td>
<td>3.000</td>
<td>1</td>
<td>0.005</td>
<td>2.009</td>
<td>1.002 1.332</td>
</tr>
<tr>
<td>Infectant power of</td>
<td>0.521</td>
<td>0.542</td>
<td>3.004</td>
<td>1</td>
<td>0.001</td>
<td>0.111</td>
<td>0.223 0.866</td>
</tr>
<tr>
<td>performance (m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross talk understanding (n)</td>
<td>0.877</td>
<td>0.226</td>
<td>6.988</td>
<td>1</td>
<td>0.026</td>
<td>0.200</td>
<td>1.098 3.887</td>
</tr>
<tr>
<td>constant</td>
<td>-0.192</td>
<td>1.633</td>
<td>0.233</td>
<td>1</td>
<td>0.005</td>
<td>0.549</td>
<td></td>
</tr>
</tbody>
</table>

4. Conclusion

4.1. The Educational Level Variable has a Significant Positive Effect on Whether Residents Choose to Watch Cross Talk Live Performances

The higher the education level of a person, the wider the knowledge. Under the same financial resources, the higher the education level, the more interest in the traditional cross talk culture. When the education level is primary school and below, junior high school, high school/secondary school, the proportion of people who choose to watch live cross talk performances is roughly the same. The proportion of people who choose to watch cross talk performances is 48.8%. The survey team further analyzed this. According to the pie chart in the figure below, it can be concluded that 53.3% of the people whose education level is college/undergraduate do not choose to watch cross talk live performances[14]. The proportion is more than those who choose to watch cross talk live performances.

4.2. The Monthly Income Variable has a Significant Positive Effect on Whether Residents Choose to Watch Cross Talk Performances

A person’s income level affects his quality of life. When the income is low, it is difficult for people to find suitable entertainment methods within the economic range they can afford. A higher income level means that they can pursue a higher quality of life. Focusing on mental health, the
wider the range of entertainment options, the greater the possibility of choosing to watch cross talk performances. As the income level increases, the proportion of people who choose to watch cross talk performances continues to increase, and the proportion of people who do not choose to watch cross talk performances shows a downward trend.

4.3. **Actor Popularity Variable has a Significant Positive Effect on Whether Residents Choose to Watch Cross Talk Performances**

The higher the influence of the actor popularity variable on the choice of watching cross talk performances, the more inclined they are to choose to watch cross talk performances; it reflects that in order to improve the acceptance of cross talk among residents, it is indispensable to enhance the popularity of actors. At present, cross talk still has a major problem, and there are still problems of slow development of cross talk teams of more types or factions.

4.4. **The Understanding of Cross Talk has a Significant Positive Effect on Whether Residents Choose to Watch Cross Talk Live Performances**

As people's understanding of cross talk increases, the proportion of people who choose to watch cross talk live performances is higher. When people don't know about cross talk at all (the level of understanding is 1), most of them don't choose to watch live cross talk performances. When people are very familiar with cross talk (the level of understanding is 5), the proportion of people who choose and don't choose live cross talk performances is close to 6:1, it can be inferred that the reason why some people do not choose to watch cross talk live performances is that they do not know enough about cross talk.

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**References**


